

WHAT IS CLAIMED IS:

1. A system for ensuring that a fastener torquing operation proceeds in a predetermined manner, said system comprising:
 - a system controller for monitoring said process, said system controller provided with data relating to individual steps of said process;
 - one or more sensors for monitoring the status of certain process steps;
 - a powered fastener installation tool for initially installing one or more fasteners;
 - a torque applying tool; and
 - a torque monitor/controller in communication with said system controller and said torque applying tool, said torque monitor/controller adapted to determine whether an acceptable amount of torque has been applied to said one or more fasteners by said torque applying tool;
wherein said powered fastener installation tool is energized only after certain ones of said process steps are indicated as being satisfactorily completed; and
wherein said powered fastener installation tool is de-energized after an acceptable amount of torque is deemed to have been applied to said one or more fasteners.
2. The system of claim 1, wherein said system controller and said torque/monitor controller are part of the same device.
3. The system of claim 1, wherein said system controller and said torque/monitor controller are separate devices.

4. The system of claim 1, wherein sensors are provided to monitor one or more pre-torque application process steps.
5. The system of claim 1, wherein sensors are provided to monitor one or more post-torque application process steps.
6. The system of claim 5, wherein said system controller uses signals from said sensors to form interlocks that require said pre-torque application process steps to be successfully completed prior to energizing said fastener installation tool.
7. The system of claim 5, wherein said torque applying tool is deactivated prior to release of said interlocks.
8. The system of claim 1, further comprising a sensor for determining if a process component has been properly loaded to a work area.
9. The system of claim 1, further comprising a sensor for determining if a process component has been properly secured within a work area.
10. The system of claim 1, further comprising a sensor for determining if a particular material application process step has been completed.
11. The system of claim 1, further comprising an indicator for specifying when a particular process step has been satisfactorily completed.
12. The system of claim 1, further comprising an indicator for specifying when a particular process step has not been satisfactorily completed.
13. The system of claim 12, further comprising a means of providing information to an operator that assists the operator in satisfactorily completing the process step.

14. The system of claim 1, wherein said data is provided to said system controller and/or said torque monitor/controller automatically as a result of an operator selecting a particular program number or program name that is associated with said process.
15. The system of claim 1, wherein said data is provided to said system controller and/or said torque monitor/controller automatically as a result of the detection of a particular process component.
16. The system of claim 1, wherein there are multiple torque settings associated with the fasteners of said process.
17. The system of claim 16, wherein more than one torque applying tool is provided, each torque applying tool set to a different predetermined torque value and in communication with a torque monitor/controller.
18. The system of claim 1, wherein a process complete signal from said system controller and/or said torque monitor/controller is used as an interlock in a downstream process.
19. The system of claim 1, wherein said torque monitor/controller is in communication with a database for recording the amount of torque applied to each element.
20. The system of claim 1, wherein said torque monitor/controller is in communication with a means for displaying the amount of torque applied to each element.
21. The system of claim 1, wherein said predetermined amount of torque has an upper and lower limit.

22. The system of claim 21, wherein the application of torque to an element is considered satisfactory if the amount of torque applied thereto falls within said limits.
23. A system for ensuring that a fastener torquing operation proceeds in a predetermined manner, said system comprising:
 - a system controller for monitoring said process, said system controller provided with data relating to individual steps of said process;
 - one or more sensors for monitoring the status of certain process steps;
 - a powered combination fastener installation/torque applying tool for installing and properly torquing one or more fasteners, said combination tool adapted to automatically change its torque setting in response to an appropriate signal from said torque monitor/controller;
 - a torque monitor/controller in communication with said system controller and said combination tool, said torque monitor/controller adapted to automatically change torque settings of said combination tool and to determine whether an acceptable amount of torque has been applied to said one or more fasteners by said combination tool;
 - wherein said system controller uses signals from said one or more sensors to create interlocks that ensure said process steps are accomplished satisfactorily and in the proper order;
 - wherein said combination tool is energized only after certain ones of said process steps are indicated as being satisfactorily completed;

wherein said combination tool is de-energized after an acceptable amount of torque is deemed to have been applied to said one or more fasteners; and

wherein said torquing operation is deemed complete by said system controller only when all process steps have been completed in the proper order.

24. The system of claim 23, wherein said system controller and said torque/monitor controller are part of the same device.
25. The system of claim 23, wherein said system controller and said torque/monitor controller are separate devices.
26. The system of claim 23, wherein sensors are provided to monitor one or more pre-torque application process steps.
27. The system of claim 26, wherein said system controller uses signals from said sensors to form interlocks that require said pre-torque application process steps to be successfully completed prior to energizing said combination tool.
28. The system of claim 27, wherein an operator must engage a cycle start initiator prior to beginning said fastener installation portion of said assembly process.
29. The system of claim 27, wherein said combination tool is pneumatically powered and is de-energized by disconnecting it from a pressurized air supply.

30. The system of claim 27, wherein said fastener installation tool is electrically powered and is de-energized by disconnecting it from an electric power supply.
31. The system of claim 23, wherein sensors are provided to monitor one or more post-fastener torquing process steps.
32. The system of claim 23, wherein power is withheld from a device of a downstream process if said fastener torquing operation is deemed incomplete by said system controller.
33. The system of claim 23, further comprising a sensor for determining if a process component has been properly loaded to a work area.
34. The system of claim 23, further comprising an indicator for specifying when a particular process step has been satisfactorily completed.
35. The system of claim 23, further comprising an indicator for specifying when a particular process step has not been satisfactorily completed.
36. The system of claim 35, further comprising a means of providing information to an operator that assists the operator in satisfactorily completing the process step.
37. The system of claim 23, wherein said data is provided to said system controller and/or said torque monitor/controller automatically as a result of an operator selecting a particular program number or program name that is associated with said process.

38. The system of claim 23, wherein said data is provided to said system controller and/or said torque monitor/controller automatically as a result of the detection of a particular process component.
39. The system of claim 23, wherein there are multiple torque settings associated with the fasteners of said process.
40. The system of claim 23, wherein a signal from said system controller and/or said torque monitor/controller is used as an interlock in a downstream process.
41. The system of claim 23, wherein said torque monitor/controller is in communication with a database for recording the amount of torque applied to each fastener.
42. The system of claim 23, wherein said torque monitor/controller is in communication with a means for displaying the amount of torque applied to each fastener.
43. The system of claim 23, wherein said predetermined amount of torque has an upper and lower limit.
44. The system of claim 43, wherein the application of torque to a fastener is considered satisfactory if the amount of torque applied thereto falls within said limits.
45. The system of claim 23, wherein said component assembly is traveling along a moving assembly line.
46. A method of ensuring that a fastener torquing operation proceeds in a predetermined manner, said method comprising:

providing a system controller for monitoring said process, said system controller provided with data relating to individual steps of said process;

employing one or more sensors to monitor the status of certain process steps;

providing a powered fastener installation tool in communication with said system controller, said fastener installation tool for initially installing said one or more fasteners;

using a torque applying tool to apply a predetermined amount of torque to said one or more fasteners, said torque applying tool adapted to transmit a signal to a torque monitor/controller upon application of said predetermined amount of torque to a fastener;

providing a torque monitor/controller in communication with said system controller and said torque applying tool, said torque monitor/controller adapted to determine whether an acceptable amount of torque has been applied to said one or more fasteners by said torque applying tool;

causing said system controller to use signals from said one or more sensors to create interlocks that ensure said process steps are accomplished satisfactorily and in the proper order;

withholding power to said powered fastener installation tool until certain ones of said process steps are indicated by said system controller as being satisfactorily completed; and

de-energizing said powered fastener installation tool after an acceptable amount of torque is deemed to have been applied to said one or more fasteners;

wherein said torquing operation is deemed complete by said system controller only when all process steps have been completed in the proper order.

47. The method of claim 46, wherein said system controller and said torque/monitor controller are part of the same device.
48. The method of claim 46, wherein said system controller and said torque/monitor controller are separate devices.
49. The method of claim 46, wherein sensors are provided to monitor one or more pre-torque application process steps.
50. The method of claim 49, wherein said system controller uses signals from said sensors to form interlocks that require said pre-torque application process steps to be successfully completed prior to energizing said fastener installation tool.
51. The method of claim 46, wherein an operator must engage a cycle start initiator prior to beginning said fastener installation portion of said assembly process.
52. The method of claim 46, wherein said fastener installation tool is pneumatically powered and is de-energized by disconnecting it from a pressurized air supply.

53. The method of claim 46, wherein said fastener installation tool is electrically powered and is de-energized by disconnecting it from an electric power supply.
54. The method of claim 46, wherein sensors are provided to monitor one or more post-torquing process steps.
55. The system of claim 46, wherein power is withheld from a device of a downstream process if said fastener torquing operation is deemed incomplete by said system controller..
56. The method of claim 46, further comprising using a sensor to determine if a process component has been properly loaded to a work area.
57. The method of claim 46, further comprising using a sensor to determine if a process component has been properly secured within a work area.
58. The method of claim 46, further comprising using a sensor to determine if a particular material has been properly applied to a process component.
59. The method of claim 46, further comprising using an indicator to specify when a particular process step has been satisfactorily completed.
60. The method of claim 46, further comprising using an indicator to specify when a particular process step has not been satisfactorily completed.
61. The method of claim 60, further comprising employing a means of providing information to an operator that assists the operator in satisfactorily completing the process step.
62. The method of claim 46, wherein said data is provided to said system controller and/or said torque monitor/controller automatically as a result of an

operator selecting a particular program number or program name that is associated with said process.

63. The method of claim 46, wherein said data is provided to said system controller and/or said torque monitor/controller automatically as a result of the detection of a particular process component.
64. The method of claim 46, wherein there are multiple torque settings associated with the fasteners of said process.
65. The method of claim 64, wherein more than one torque applying tool is provided, each torque applying tool set to a different predetermined torque value and in communication with a torque monitor/controller.
66. The method of claim 46, further comprising using a signal from said system controller and/or said torque monitor/controller as an interlock in a downstream process.
67. The method of claim 46, further comprising placing said torque monitor/controller in communication with a database for recording the amount of torque applied to each fastener.
68. The method of claim 46, further comprising placing said torque monitor/controller in communication with a means for displaying the amount of torque applied to each fastener.
69. The method of claim 46, wherein said predetermined amount of torque has an upper and lower limit.

70. The method of claim 69, wherein the application of torque to a fastener is considered satisfactory if the amount of torque applied thereto falls within said limits.